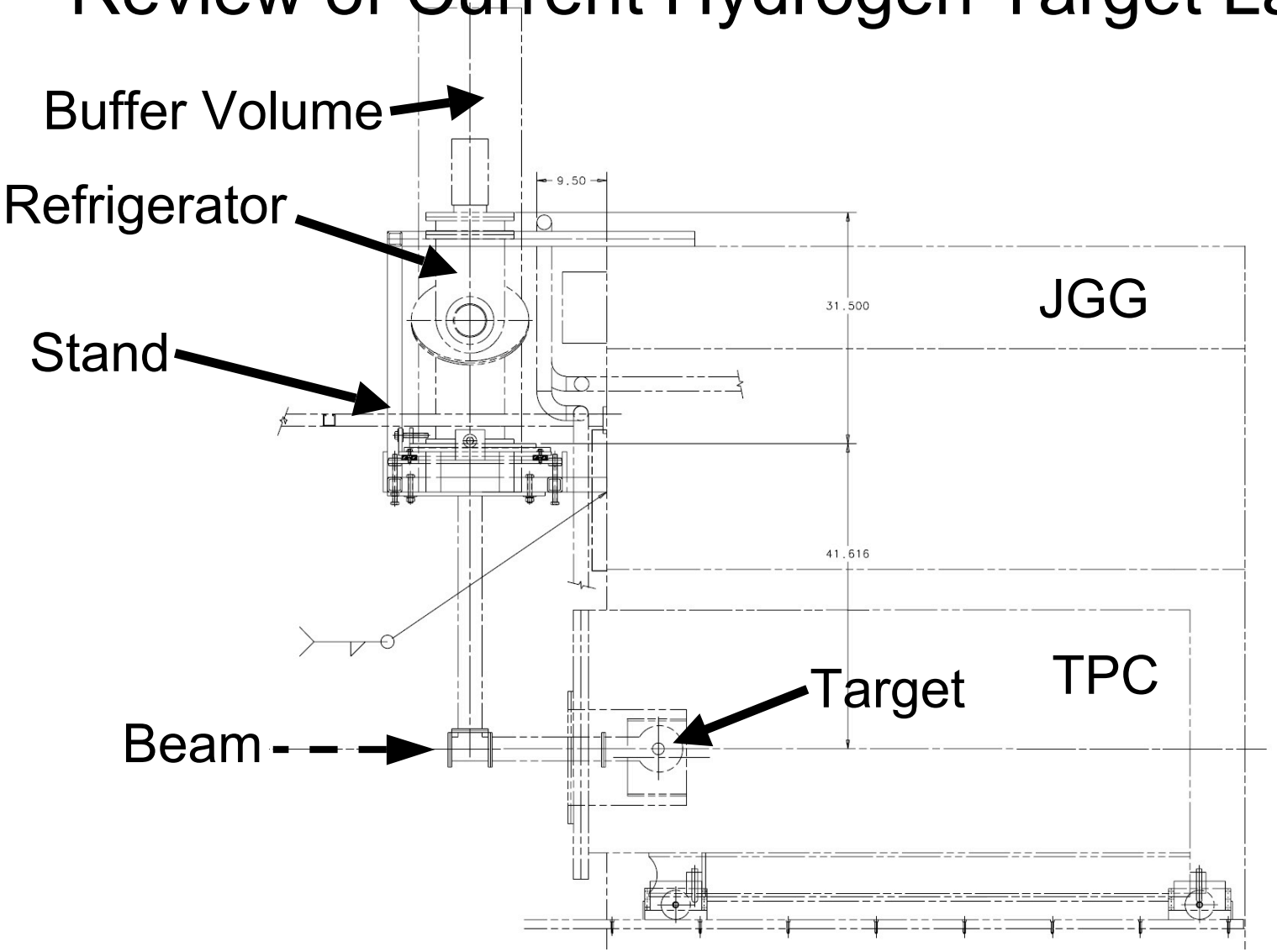
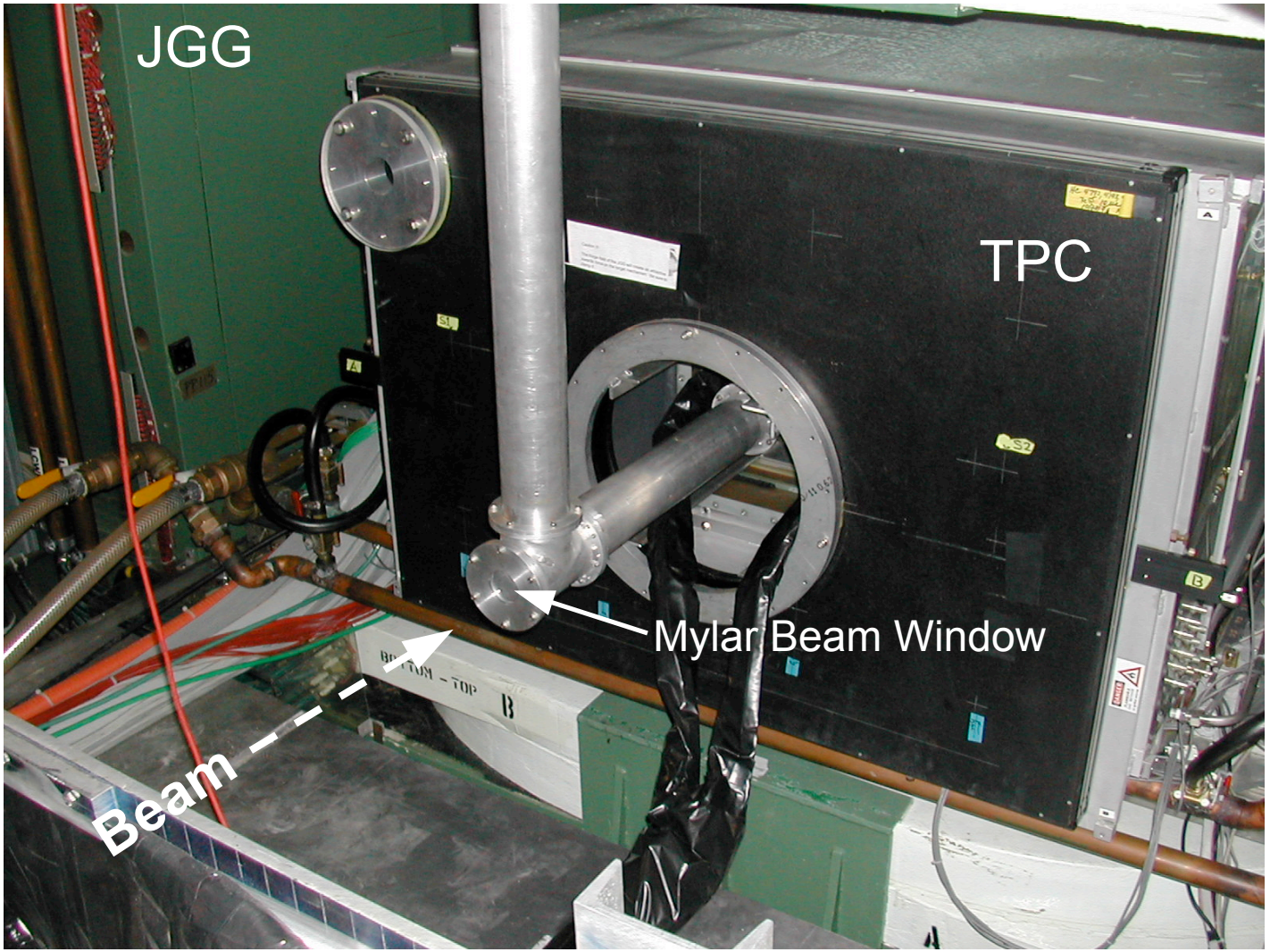
H2 Target Upgrade

Terry Tope - 12/9/06

Review of Current Hydrogen Target Layout

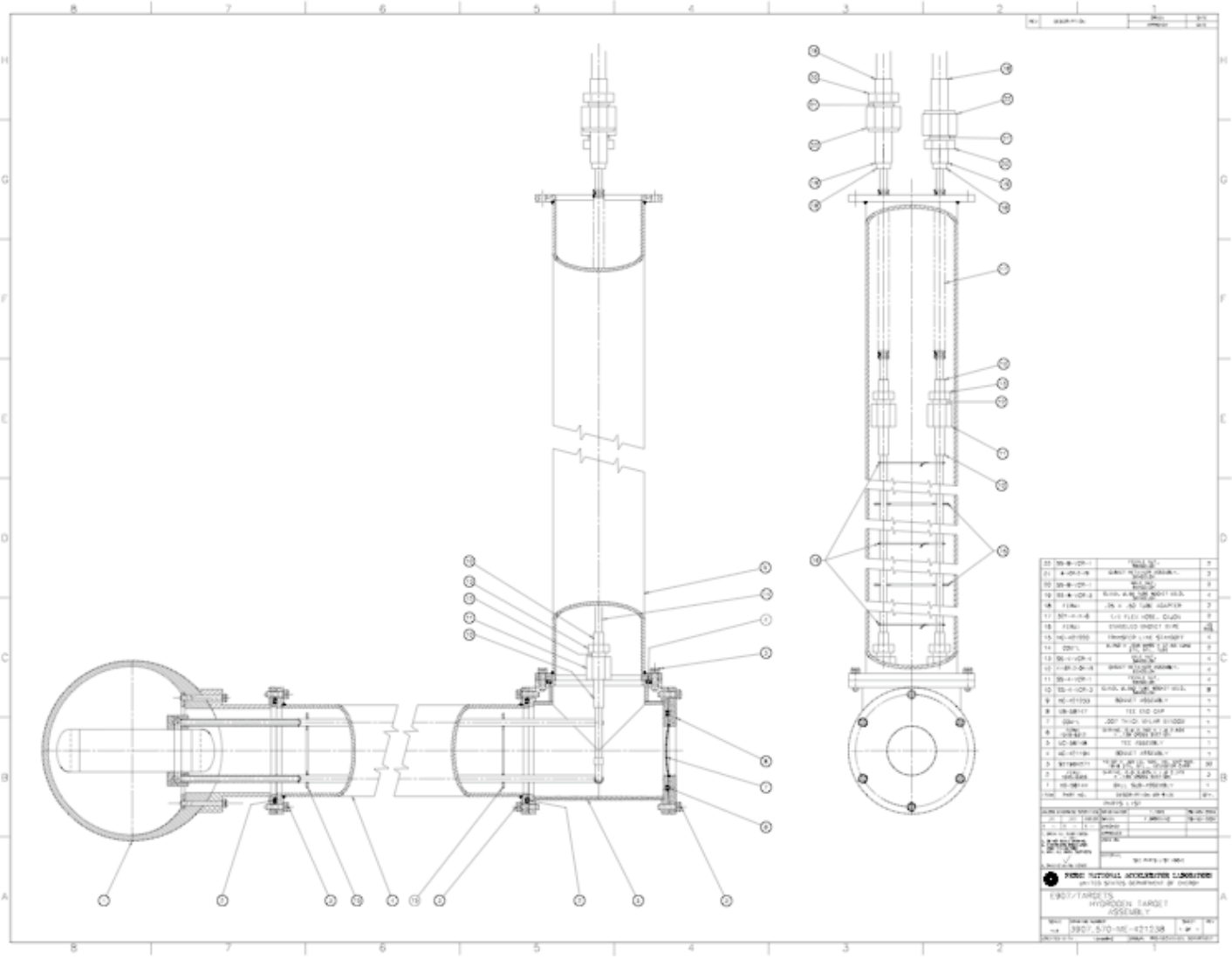


Current Hydrogen Target Layout

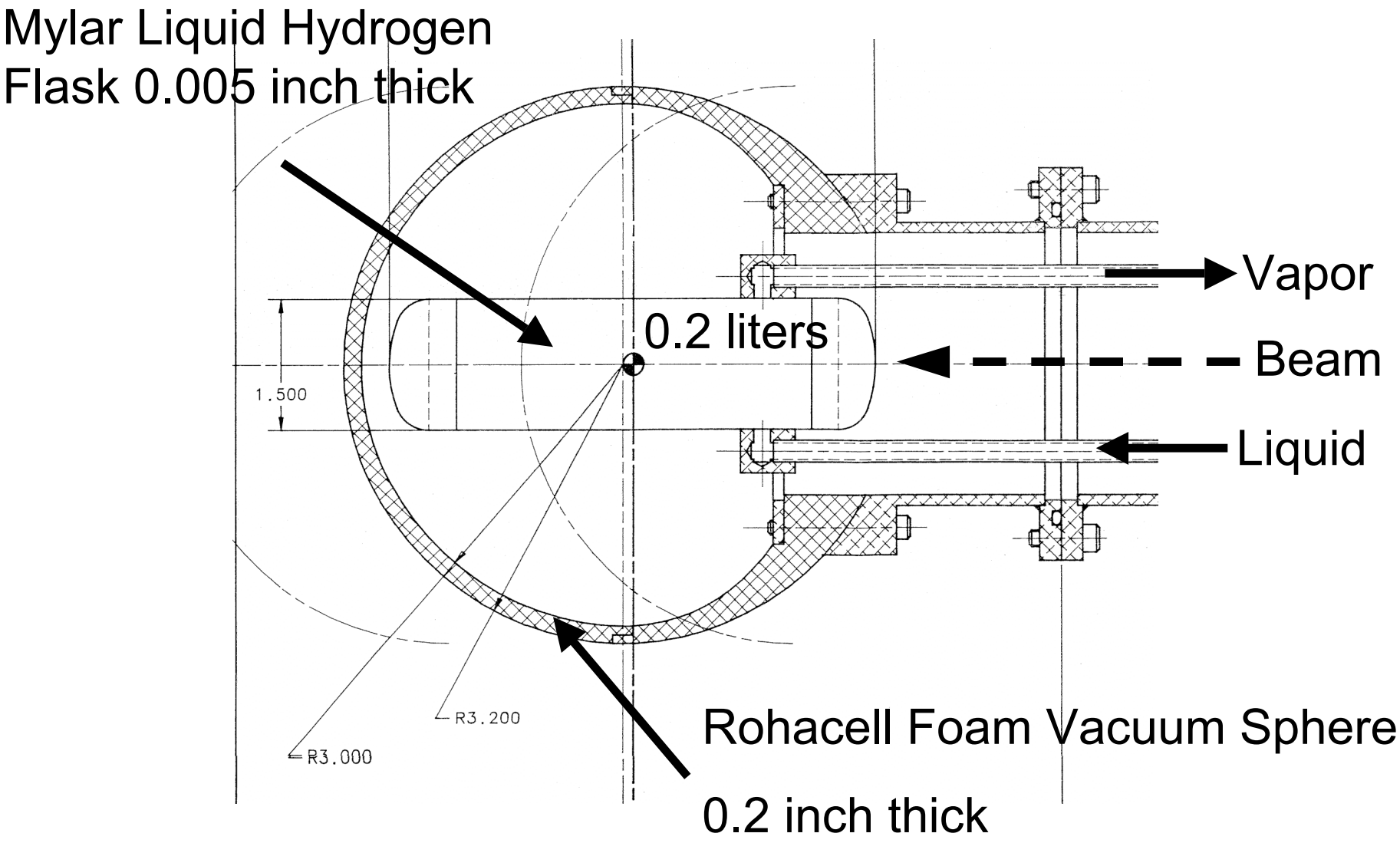


Current Hydrogen Target Layout

Current Hydrogen Target Refrigerator Connection



Current Hydrogen Flask & Vacuum Sphere



Target Upgrade Tasks

- Enlarge horizontal beam tube to avoid interaction with metal walls
  - What diameter tube?
  - Same volume flask?
- New target support stand required
  - Old stand incompatible with JGG modifications
  - How to integrate with the plastic ball?
  - What HV electronics will be near target?
    - May need an inert gas purge to meet safety requirements

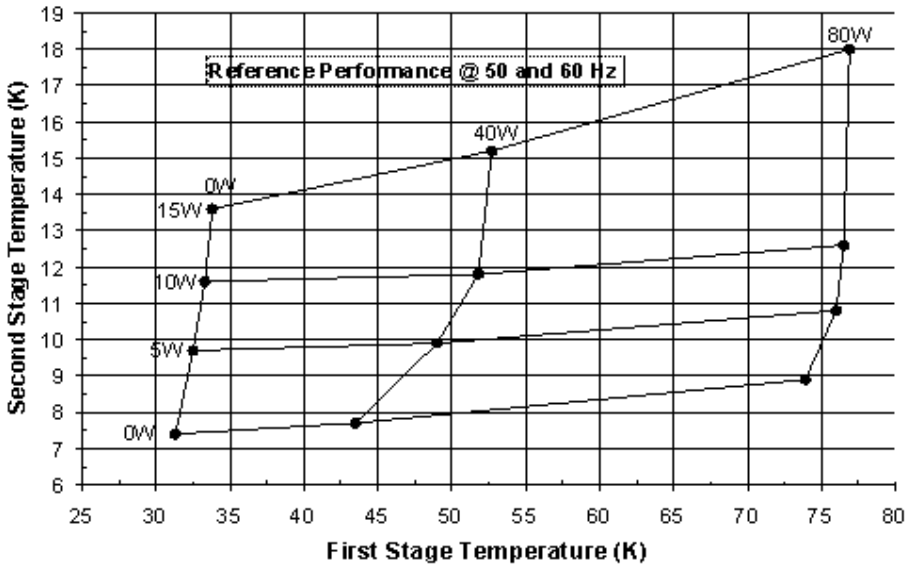
Target Upgrade

- Purchase new cryocooler
  - Current cryocooler is 20+ years old
  - New cryocooler offers improved reliability, 20k hours until first maintenance
  - Automation of manual adjustments
  - Ability to use cryocooler for N2 target using same fluid circuit as H2 by crippling cryocooler with heaters

14 W @ 20K

80 W @ 80 K

Cryomech pulse tube cryocooler



Target Upgrade

- Effort
  - $68k M&S, $76k labor

H2 target transfer line upgrade and support relocation
Mechanical design of new transfer line - 2 weeks - Mech Engineer 100%, Fermi Physicist 10%
Fabrication drawings for new transfer line - 3 weeks - Drafter 100%, Mech Engineer 20%
Order parts for new transfer line - 2 weeks - Mech Engineer 10%, $2000
Fabrication of new transfer line - 4 weeks - Mech Tech 100%, Machinist 75% Welder 10%
Assembly of new transfer line - 1 week - Mech Tech 100%
Mechanical design of new support structure - 3 weeks - Mech Engineer 100%, Fermi Physicist 5%
Fabrication drawings for support structure - 3 weeks - Drafter 100%, Mech Engineer 20%
Order parts for support structure - 2 weeks - Mech Engineer 10%, $5,000
Fabrication of support structure - 3 weeks - Mech Tech 100%, Welder 50%, Machinist 50%, Mech Engineer 10%
Installation of support structure - 1 week - Mech Tech 100% (2 people at 50%), Welder 50%
Installation of target assembly and refrigerator - 1 week - Mech Tech 100%, Engineer 50%
Maintenance of vacuum system and cryocooler - 1 week - Mech Tech 50%, $1000
Helium leak check of target - 1 week - Mech Tech 100% (2 people at 50% each)
Safety report update - 2 weeks - Mech Engineer 100%
Safety report review - 3 weeks - Mech Engineer 20% (4 people at 5% each)

Nitrogen target
Design of nitrogen target - 4 weeks - Mech Engineer 100%, Fermi Physicist 5%
Fabrication drawings for nitrogen target - 3 weeks - Drafter 100%, Mech Engineer 20%
Order parts for nitrogen target - 3 weeks - Mech Engineer 10%, $10,000
Fabrication of nitrogen target - 3 weeks - Mech Tech 100%, Machinist 50%, Welder 25%
Assembly and installation of nitrogen target - 2 weeks - Mech Tech 100% (2 at 50% each), Mech Engineer 25%
Wiring of nitrogen target - 1 week - Elect Tech 100%, Mech Engineer 10%
PLC and HMI programming/testing - 1 week - Mech Engineer 100%

Spare cryocooler
Selection and purchase of new cryocooler and chiller - 6 weeks - Mech Engineer 10%, $48,000
Make drawings to retrofit cryocooler - 2 weeks - Drafter 100%, Mech Engineer 25%
Order parts to make cryocooler compatible with H2 target - 3 weeks - Mech engineer 25%, $7,000
Fabricate parts to make cryocooler compatible with H2 target - 4 weeks - Mech Tech 100%, Machinist 50%, Welder 25%, Mech Engineer 20%
Assemble cryocooler - 2 weeks - Mech Tech 100%, Elect Tech 25%, Welder 20%, Mech Engineer 25%